

What is claimed is:

1           1. A signal distribution system for serving a plurality of customers using a shared  
2 cable modem coupled to a shared cable TV signal distribution or other transmission medium,  
3 comprising:

4                 a shared cable modem coupled to said medium;

5                 a shared local area network packet switch and concentrator coupled by a local  
6 area network segment or other data path to said shared cable modem and having at  
7 least one local area network port for each subscriber that shares said modem;

8                 a plurality of diplexer filters each having high frequency input coupled to  
9 said cable TV signal delivery medium and a low frequency input coupled to a port of  
10 said switch and concentrator and each having a drop cable output for coupling to a  
11 coaxial drop cable for coupling to and forming part of a local area network of each  
12 subscriber.

1           2. The system of claim 1 further comprising a diplexer filter located in each  
2 customer premise having a coaxial cable input coupled to a coaxial drop cable from one of  
3 said plurality of diplexer filters and having a coaxial cable output for coupling to a coaxial  
4 cable analog CATV distribution system in said subscriber's home and having a low frequency  
5 output for coupling through a balun to a local area network in said subscriber's premises.

1           3. A process comprising the steps of:

2                 receiving simultaneously in a plurality of diplexer filters from a cable TV  
3 signal delivery medium downstream analog CATV signals and downstream RF signals  
4 carrying downstream packet data and upstream RF signals carrying upstream packet  
5 data and filtering out in each diplexer filter all but said downstream analog CATV  
6 signals, and, in each said diplexer filter, receiving from a LAN segment input  
7 baseband packet data transmissions, and, in each diplexer filter, combining said  
8 baseband packet data transmissions with said downstream analog CATV signals and  
9 transmitting the combined signals on a coaxial cable drop line coupled to a local area  
10 network of a predetermined one of a plurality of subscribers who share a cable  
11 modem outside the premises of said subscribers, and selectively filtering to select

upstream baseband packet data from the local area network of each subscriber on said coaxial cable drop line and coupling said selected upstream baseband packet data onto said LAN segment;

receiving simultaneously in a shared cable modem from said cable TV signal delivery medium downstream analog CATV signals and downstream RF signals carrying downstream packet data and upstream RF signals carrying upstream packet data transmitted by other cable modems and filtering out in said shared cable modem all but said downstream RF signals carrying downstream packet data and recovering said packet data and filtering out all packets not addressed to a subscriber that is sharing said shared cable modem and transmitting the remaining packets out on a first LAN segment or other data path, and receiving upstream baseband packet data from said first LAN segment and transmitting them to said headend over said cable TV signal delivery medium using whatever upstream media access control and physical layer protocols are in use on said cable TV signal delivery medium;

receiving said packets transmitted on said first LAN segment or other data path and examining the address data in the packet headers and routing each packet to an appropriate LAN segment or segments coupled to one or more diplexer filters, and receiving said upstream baseband packet data transmissions from said LAN segments coupled to said diplexer filters and concentrating them onto said first LAN segment for transmission to said shared cable modem.

4. The process of claim 3 further comprising the steps carried out in each subscriber premises of receiving said downstream baseband packet data transmissions with said downstream analog CATV signals in a diplexer filter from one of said coaxial cable drop lines and high pass filtering said analog CATV signals and coupling them to a coaxial cable CATV signal distribution system in said customer premises, and low pass filtering said baseband packet data and coupling said packet data to a local area network medium in said customer premises, and selectively filtering upstream baseband packet data transmissions on said local area network medium so as to couple them onto said coaxial cable drop line, and receiving upstream baseband packet data transmissions from said local area network medium and selectively filtering so as to couple said upstream baseband packet data transmissions onto said coaxial cable drop line.

1           5. An apparatus comprising:

2                 filtration and combining means having a plurality of baseband LAN data inputs  
3                 and a plurality of RF inputs for coupling to a CATV signal delivery medium and having  
4                 a plurality coaxial cable drop line outputs for coupling to coaxial cable drop lines,  
5                 each coupled to a local area network of a predetermined subscriber, for receiving at  
6                 each of said RF inputs downstream analog CATV signals and downstream RF signals  
7                 carrying downstream packet data and upstream RF signals carrying upstream packet  
8                 data and for filtering all but said downstream analog CATV signals and transmitting  
9                 said downstream analog CATV signals out simultaneously at each coaxial cable drop  
10                line output, and, for receiving at each LAN data input packet data coupled to a LAN  
11                segment transmissions addressed to a predetermined subscriber, and for combining  
12                said baseband packet data transmissions with said downstream analog CATV signals  
13                and transmitting the combined signals on the coaxial cable drop line output coupled to  
14                a local area network of a predetermined subscriber to which said packet data is  
15                supposed to be delivered, and for receiving upstream baseband packet data on said  
16                coaxial cable drop lines from one or more of said subscribers and selectively  
17                filtering so as to couple said upstream baseband packet data onto an appropriate LAN  
18                segment dedicated to carrying upstream and downstream LAN packet traffic for the  
19                particular subscriber from which each upstream LAN packet originated;

20                shared cable modem means having an RF input for coupling to a CATV signal  
21                delivery medium and having a LAN output coupled to a LAN segment, for receiving  
22                simultaneously downstream analog CATV signals and downstream RF signals carrying  
23                downstream packet data and upstream RF signals carrying upstream packet data  
24                transmitted by other shared and unshared cable modems and for filtering out all but  
25                said downstream RF signals carrying downstream packet data and for recovering said  
26                packet data and for filtering out all packets not addressed to a subscriber that is  
27                sharing said shared cable modem means and for transmitting the remaining packets  
28                out on a first LAN segment coupled to said LAN output, and for receiving upstream  
29                LAN packets from said first LAN segment and transmitting them to said headend using  
30                whatever media access control and physical layer protocols that are in use on said  
31                CATV signal delivery medium;

switch and concentrator means having a first LAN segment input coupled to said first LAN segment and having a plurality of LAN ports, each coupled by a LAN segment to a LAN input of said filtration and combining means, for receiving said packets transmitted on said first local area network segment from said shared cable modem means and examining the address data in the packet headers and routing each packet to an appropriate LAN segment or segments coupled to one or more LAN input of said filtration and combination means, and for receiving upstream LAN packet data from each said LAN segment coupled to a LAN input of said filtration and combining means and concentrating said upstream LAN packets for transmission on said first LAN segment to said shared cable modem means; and

filtration and distribution means in each customer premises coupled by a coaxial cable to one of said coaxial cable drop lines from said filtration and combining means for selecting said analog CATV signals and coupling them onto an analog CATV signal distribution system in said customer premises, and for selecting said baseband packet traffic and coupling it to a local area network medium in said customer premises.

6. A signal distribution system for transmitting and receiving signals on a cable television medium carrying analog television broadcasts and digital voice-over-IP data carrying telephony signals, comprising:

a shared cable modem coupled to said medium;

a plurality of junction boxes, each having a coaxial cable input, a twisted pair tip and ring input and a siamese cable output for coupling to a siamese cable for coupling to at least one telephone and at least one television in the premises of a subscriber who shares said cable modem, each said junction box coupling analog phone signals arriving at said twisted pair tip and ring input to a tip and ring twisted pair terminal at said siamese cable output so that when a siamese cable is correctly coupled to said output, said twisted pair tip and ring input will be coupled to a tip and ring pair of said siamese cable going to the premises of a subscriber that shares said cable modem, and each said junction box coupling analog cable television signals received at said coaxial cable input to the coaxial cable portion of any siamese cable coupled to said siamese cable output;

a voice-over-IP gateway coupled by a data path to said shared cable modem,  
and having a plurality of subscriber line interface circuits, each coupled to said  
twisted pair tip and ring input of a junction box by a tip and ring twisted pair.

7. The apparatus of claim 6 further comprising a junction box in each subscriber  
premises having an input for coupling to a siamese cable coupled to a junction box outside  
said customer premises, said junction box having connections to couple said coaxial cable  
portion of said siamese cable to an analog CATV signal distribution system in said customer  
premises and connections to couple said twisted pair portion of said siamese cable to a  
twisted pair POTS analog phone signal distribution system in said customer premises.

8. The apparatus of claim 6 wherein said cable modem functions to receive said  
downstream voice-over-IP packets and select only those addressed to a subscriber that  
shares said cable modem and route them to said voice-over-IP gateway, and wherein said  
voice-over-IP gateway functions to receive said voice-over-IP packets from said cable  
modem and routes them to the subscriber line interface circuit coupled to the subscriber to  
which said packets are addressed.

9. An process comprising:  
receiving radio frequency signals bearing downstream voice-over-IP packets  
and recovering said voice-over-IP packets and selecting only those packets which  
are addressed to a subscriber sharing a cable modem;  
transmitting the selected downstream voice-over-IP packets from said  
shared cable modem to a voice-over-IP gateway having a plurality of subscriber line  
interface circuits;  
using the addressing information in said selected packets to route each packet  
to the appropriate subscriber line interface circuit;  
in each subscriber line interface circuit, generating conventional POTS  
analog telephony signals and transmitting said signals to a subscriber who shares  
said cable modem via a tip and ring pair of a siamese cable, and receiving upstream  
POTS telephony signals and converting them to upstream POTS digital data;

14 packetizing said upstream POTS digital data and routing said upstream POTS  
15 digital data packets to said shared cable modem;

16 transmitting said upstream POTS digital data packets to a headend of a cable  
17 TV system via a hybrid fiber coaxial cable network using whatever media access  
18 control and physical layer protocols are in use on said hybrid fiber coaxial cable  
19 network;

20 receiving downstream CATV analog signals from said headend via said hybrid  
21 fiber coaxial cable network and transmitting said CATV analog signals to each  
22 subscriber which is sharing said cable modem via the coaxial cable portion of a  
23 siamese cable drop line going to the premises of said subscriber.

1 10. The process of claim 9 further comprising the steps of coupling signals from a  
2 coaxial cable portion of a siamese cable drop line to an analog CATV signal distribution  
3 system in the customer premises and coupling POTS analog telephone signals from a twisted  
4 pair portion of said siamese cable drop line to a POTS analog telephone signal distribution  
5 system in said customer premises.

1 11. An apparatus comprising:

2 cable modem means for receiving from a transmission medium signals  
3 bearing voice-over-IP packets and recovering said voice-over-IP packets and  
4 selecting only those packets which are addressed to a subscriber sharing said cable  
5 modem means and for transmitting the selected packets over a LAN segment or other  
6 data path;

7 voice-over-IP gateway means having a plurality of subscriber line interface  
8 circuit means for using the addressing information in said selected packets to route  
9 each packet to the appropriate subscriber line interface circuit means;

10 a plurality of subscriber line interface circuit means, each for generating  
11 conventional POTS analog telephony signals from said voice-over-IP packet data  
12 routed to it and for transmitting said POTS analog telephony signals to a subscriber  
13 who shares said cable modem means via a tip and ring pair of a siamese cable, and for  
14 receiving upstream POTS telephony signals and converting them to upstream POTS  
15 digital data;

and wherein said voice-over-IP gateway means also functions to packetize said upstream POTS digital data and route the resulting packets to said shared cable modem;

and wherein said cable modem means also functions to transmit said upstream POTS digital data packets to the headend of a cable TV system via a hybrid fiber coaxial cable network using whatever media access control and physical layer protocol is in use on said transmission medium; and

means for receiving downstream CATV analog signals from said headend via said hybrid fiber coaxial cable network and transmitting said CATV analog signals to each subscriber which is sharing said cable modem via the coaxial cable portion of a siamese cable drop line going to the premises of said subscriber; and

distribution means in each said customer premises for coupling said analog CATV signals arriving on the coaxial cable portion of a siamese cable drop line to an analog CATV signal distribution system in said customer premises and for coupling a twisted pair portion of said siamese cable drop line to an analog POTS telephone distribution system in said customer premises.

## 12. An apparatus comprising:

a shared cable modem for coupling to a hybrid fiber coaxial cable CATV signal distribution medium;

a DSL concentrator coupled to said shared cable modem by a LAN segment or data path, each DSL concentrator having a plurality of XDSL modems, where XDSL means any type of DSL modem, each XDSL modem coupled to a twisted pair telephone line to send and receive XDSL signals therethrough;

a plurality of siamese cable drop lines for coupling to a plurality of subscribers, each having a twisted pair and a coaxial cable;

a plurality of junction boxes having a coaxial cable input for coupling to said hybrid fiber coaxial cable CATV signal distribution medium by a coaxial cable tap and each having a tip and ring input coupled to a twisted pair coupled to an XDSL modem in said DSL concentrator, and each having an output coupled a siamese cable, and functioning to couple XDSL signals arriving at said tip and ring input from an XDSL modem of said DSL concentrator to said twisted pair of said siamese cable coupled to

said output and functioning to couple analog CATV signals received at said coaxial cable input to the coaxial cable of the siamese cable coupled to said output.

13. A process comprising:

using a shared cable modem, receiving from a transmission medium signals bearing downstream digital data representing the POTS, high speed downstream and lower speed bidirectional channels of DSL signals for each of a plurality of subscriber who share a cable modem, and recovering said digital data for each subscriber and determining to which subscriber sharing said cable modem the recovered data pertains;

transmitting the recovered data from said shared cable modem to a DSL concentrator having a plurality of XDSL modems therein or associated therewith;

routing said digital data received from said shared cable modem to the appropriate XDSL modem assigned to service a particular subscriber which shares said cable modem;

in each XDSL modem converting said digital data to a XDSL signal and transmitting said XDSL signal to a subscriber who shares said cable modem via a tip and ring pair of a siamese cable, and receiving upstream XDSL signals and converting them to upstream XDSL digital data;

transmitting said upstream digital data from each said XDSL modem to said shared cable modem via a LAN segment or other data path;

transmitting said upstream XDSL digital data from each subscriber to a headend of a cable TV system using said shared cable modem via a hybrid fiber coaxial cable transmission medium using whatever media access control protocol and physical layer protocol is in use on said hybrid fiber coaxial cable transmission medium;

receiving downstream CATV analog signals from said headend via said hybrid fiber coaxial cable medium and transmitting said CATV analog signals to each subscriber which is sharing said cable modem via a coaxial cable portion of a siamese cable drop line going to the premises of said subscriber.



1 14. [Fig. 3] An apparatus comprising:

2 shared cable modem means for receiving from a CATV signal delivery medium  
3 signals bearing downstream digital data representing the POTS, high speed  
4 downstream and lower speed bidirectional channels of DSL signals for each of a  
5 plurality of subscriber who share said cable modem means, and for recovering said  
6 digital data for each subscriber and determining to which subscriber sharing said  
7 cable modem means the recovered data pertains, and for transmitting the recovered  
8 data from said shared cable modem to a DSL concentrator means having a plurality of  
9 DSL modem means therein or associated therewith, and for receiving upstream DSL  
10 data packets and transmitting them over said CATV signal delivery medium using  
11 whatever media access control and physical layer protocols are in use on said CATV  
12 signal delivery medium;

13 DSL concentrator means having a plurality of XDSL modem means, each  
14 assigned to service one subscriber who shares said cable modem means, for routing  
15 said digital data received from said shared cable modem means to the appropriate  
16 XDSL modem means assigned to service a particular subscriber to whom a DSL signal  
17 created from said received digital data is supposed to be sent;

18 each of said XDSL modem means for converting said digital data routed to it by  
19 said DSL concentrator to an XDSL signal and transmitting said XDSL signal to a  
20 subscriber who shares said cable modem means and to whom said received digital data  
21 is addressed, said transmission being via a tip and ring pair of a siamese cable, and  
22 for receiving upstream DSL signals and converting them to upstream DSL data  
23 packets;

24 and wherein said DSL concentrator means further functions to transmit said  
25 upstream DSL data packets from each said XDSL modem to said shared cable modem  
26 means via a LAN segment or other data path;

27 filter means for receiving downstream CATV analog signals from said headend  
28 via said hybrid fiber coaxial cable medium and for transmitting said CATV analog  
29 signals to each subscriber which is sharing said cable modem via a coaxial cable  
30 portion of a siamese cable drop line going to the premises of said subscriber;

31 in each subscriber premises, a junction box coupling a coaxial cable portion  
32 of said siamese cable drop line to a CATV coaxial cable signal distribution system in

the subscriber premises and coupling the twisted pair portion of said siamese cable drop line to a twisted pair POTS phone signal distribution system in said subscriber premises; and

an XDSL modem means coupled to said twisted pair POTS phone signal distribution system in said subscriber premises for recovering downstream LAN packets from both the high speed downstream and lower speed bidirectional channels of the XDSL signal on said twisted pair POTS phone signal distribution system and for outputting said recovered downstream LAN packets on a LAN transmission medium in said subscriber premises, and for receiving upstream LAN packets for the DSL bidirectional lower speed channel and converting them to signals for said upstream DSL bidirectional channel.

15. [Fig. 4] A signal distribution system for serving a plurality of customers using a shared cable modem coupled to a shared CATV signal delivery medium, comprising:

a shared cable modem coupled to said medium for recovering downstream LAN packets and downstream DSL packet data and outputting packet data on a local area network segment, and for receiving upstream XDSL packet data and transmitting it to a headend via said medium;

a shared local area network packet switch and concentrator coupled by a LAN port and local area network segment to said cable modem and having at least one LAN port for each subscriber that shares said modem;

a plurality of diplexer filters each having high frequency input coupled to said cable TV signal delivery medium and a low frequency input coupled to a LAN port of said switch and concentrator and each having a drop cable output for coupling to a coaxial cable in a siamese cable drop line, each diplexer filter having a junction box therein having a twisted pair input and a twisted pair output for coupling to the twisted pair of one of said siamese cable drop lines, each said diplexer filter and junction box combination functioning to filter out all signals but downstream analog cable TV broadcast signals and couple said analog cable TV broadcast signals onto the coaxial cable of a siamese cable drop line and to receive baseband LAN packet data from said cable modem and packet switch and couple said LAN packet data onto a coaxial cable portion of the appropriate siamese cable drop line coupled to the

subscriber to which the siamese cable is connected along with said analog TV signals and for selectively filtering to select upstream LAN packet data packets from said coaxial cable portion of each siamese cable drop line and transmit said selected upstream LAN packets to the appropriate LAN port of said packet switch, and said junction box for coupling XDSL signals received at said twisted pair input onto a twisted pair portion of said siamese cable drop line coupled to the subscriber premises to which said XDSL signals are to be delivered and for coupling upstream XDSL signal onto the appropriate one of a plurality of twisted pair telephone lines dedicated to transmission of XDSL signals for the subscriber from whom said upstream XDSL signal originated;

a DSL concentrator coupled to said shared cable modem by a data path, said DSL concentrator having a plurality of XDSL modems, each XDSL modem coupled to a twisted pair telephone line which is coupled to said twisted pair input of a junction box in one of said diplexer filters and dedicated to sending downstream and receiving upstream XDSL signals to and from a particular subscriber who shares said cable modem via said twisted pair telephone lines dedicated to transmission of XDSL signals for said particular subscriber, each said XDSL modem for converting upstream XDSL signals to upstream XDSL packet data and sending each said packet to said cable modem via said DSL concentrator for transmission to said headend;

a plurality of siamese cable drop lines, each having a coaxial cable portion and a twisted pair telephone line portion, said coaxial cable portion coupled to said drop cable output of one of said diplexer filters and each said twisted pair telephone line coupled to said twisted pair output of a junction box associated with the same diplexer filter to which said coaxial cable portion of said siamese cable drop line is coupled, each siamese cable drop line for coupling to a local area network of one of said plurality of subscribers which share said cable modem.

16. [Fig. 4 process] A process comprising:

receiving simultaneously in a plurality of diplexer filters from a cable TV signal delivery medium downstream analog CATV signals and downstream RF signals carrying downstream packet data and upstream RF signals carrying upstream packet data and filtering out in each diplexer filter all but said downstream analog CATV

6 signals, and, in each said diplexer filter, receiving from a LAN segment input  
 7 baseband packet data transmissions, and, in each diplexer filter, combining said  
 8 baseband packet data transmissions with said downstream analog CATV signals and  
 9 transmitting the combined signals on a coaxial cable portion of a siamese cable drop  
 10 line coupled to a distribution circuit of a predetermined one of a plurality of  
 11 subscribers who share a cable modem located outside the premises of said  
 12 subscribers, and selectively filtering to select upstream LAN packets from the  
 13 coaxial cable portions of said siamese cable drop lines from a plurality of  
 14 subscribers who share a cable modem, and transmitting said upstream LAN packets  
 15 to the port of a shared packet switch dedicated to sending and receiving upstream and  
 16 downstream LAN traffic for a particular one of said plurality of subscribers;

17 receiving simultaneously in said shared cable modem from said CATV signal  
 18 delivery medium downstream analog CATV signals and downstream signals carrying  
 19 downstream packet data and upstream signals carrying upstream packet data  
 20 transmitted by other cable modems and filtering out in said shared cable modem all  
 21 but said downstream signals carrying downstream packet data and recovering LAN  
 22 packets and DSL packets therefrom, and filtering out all LAN and DSL packets not  
 23 addressed to a subscriber that is sharing said cable modem and transmitting the  
 24 selected downstream LAN and DSL packets out on a first LAN segment or other data  
 25 path, and receiving upstream LAN and DSL packets from said first LAN segment and  
 26 transmitting said upstream LAN and DSL packets to a headend using whatever media  
 27 access protocol and physical layer protocol is in use on said CATV signal delivery  
 28 medium;

29 receiving said downstream LAN and DSL packets transmitted on said first LAN  
 30 segment or other data path in a shared packet switch, and determining to which  
 31 subscriber who is sharing said cable modem each of said downstream LAN and DSL  
 32 packets are directed, and routing each LAN packet to an appropriate LAN segment  
 33 coupled to said LAN segment input of a diplexer filter dedicated to the subscriber to  
 34 whom said LAN packet is addressed, and, in said diplexer filter, coupling said  
 35 downstream LAN packets onto a coaxial cable portion of a siamese cable drop line  
 36 dedicated to said subscriber to whom said LAN packet is addressed, and in each  
 37 diplexer filter, selectively filtering to select upstream LAN packets from the coaxial

3 8 cable portion of the siamese cable drop line dedicated to the subscriber from whom  
3 9 said upstream LAN packet originated and transmitting said selected upstream LAN  
4 0 packet to the appropriate port of said shared packet switch dedicated to sending and  
4 1 receiving LAN packets to and from said subscriber, and, in said packet switch,  
4 2 transmitting all said upstream LAN packets from all subscribers which share said  
4 3 packet switch to said shared cable modem;

4 4 in said shared cable modem, receiving one or more signals that carry  
4 5 downstream DSL packets and recovering said downstream DSL packets and discarding  
4 6 all but those downstream DSL packets addressed to one of said plurality of  
4 7 subscribers that share said cable modem and transmitting said DSL packets to a DSL  
4 8 concentrator, and receiving upstream DSL packets from said DSL concentrator and  
4 9 transmitting said upstream DSL packets to a headend using whatever media access  
5 0 protocol and physical layer protocol is in use on said CATV signal delivery medium;

5 1 in said DSL concentrator, receiving the downstream DSL packets for each  
5 2 subscriber which shares said cable modem and routing each said downstream DSL  
5 3 packet to an XDSL modem in said DSL concentrator that serves the particular  
5 4 subscriber to which said downstream DSL packet is directed;

5 5 in each said XDSL modem, converting said downstream DSL packets routed to  
5 6 said XDSL modem to a downstream XDSL signal and transmitting said downstream  
5 7 XDSL signal on a twisted pair phone line to a junction box of a diplexer filter coupled  
5 8 by a siamese cable drop line to the subscriber to whom said downstream XDSL signal  
5 9 is to be sent, and receiving upstream XDSL signals in each XDSL modem and  
6 0 converting said upstream XDSL signals to upstream DSL packets and transmitting  
6 1 said upstream DSL packets to said cable modem; and

6 2 at each said junction box in a diplexer filter, coupling said XDSL signals  
6 3 travelling in both directions between a twisted pair phone line forming part of said  
6 4 siamese cable drop line coupled to the subscriber to whom said XDSL signal is to be  
6 5 sent and a twisted pair phone line coupling said junction box to an XDSL modem  
6 6 serving the subscriber to whom the XDSL signals are to be sent and received;

6 7 in every subscriber premises, selectively filtering to select the analog CATV  
6 8 signals on a coaxial cable portion of said siamese cable drop line and coupling said  
6 9 analog CATV signals onto a coaxial cable CATV signal distribution system in said

subscriber premises, and selectively filtering to select said downstream LAN packets and transmit them on a local area network medium in said subscriber premises, and selectively filter to select upstream LAN packets from said local area network medium and couple them onto said coaxial cable portion of said siamese cable drop line, and coupling said downstream XDSL signals from a twisted pair portion of said siamese cable drop line onto a POTS phone signal distribution system in said subscriber premises, and coupling upstream XDSL signals from said POTS phone signal distribution system onto said twisted pair portion of said siamese cable drop line.

17. [Fig. 4 means plus] An apparatus comprising:

filtering and combining means for receiving from a cable TV signal delivery medium downstream analog CATV signals and downstream RF signals carrying downstream packet data and upstream RF signals carrying upstream packet data and filtering out all but said downstream analog CATV signals, and, for receiving from a plurality of LAN segments coupled to a plurality of LAN segment inputs, each dedicated to carrying LAN traffic for one of a plurality of subscriber who share said filtering and combining means, baseband downstream LAN packets, and for combining said baseband downstream LAN packets received at each said input with said downstream analog CATV signals and transmitting the combined signals on a coaxial cable portion of a siamese cable drop line dedicated to carrying signals to a subscriber to whom said downstream LAN packets are addressed, and for selectively filtering signals on said coaxial cable portion of each said siamese cable drop line to select upstream LAN packets and for transmitting said upstream LAN packets originating from each said subscriber who shares said filtering and combining means on one of said LAN segments that is dedicated to carrying LAN packet traffic for said subscriber;

shared cable modem means for receiving from a cable TV signal delivery medium downstream analog CATV signals and downstream RF signals carrying downstream LAN packets and upstream RF signals carrying upstream LAN packets transmitted by other cable modems and filtering out all but said downstream RF signals carrying downstream LAN packets and recovering said downstream LAN

23 packets and ignoring all downstream LAN packets not addressed to a subscriber that  
24 is sharing said cable modem means and transmitting the selected downstream LAN  
25 packets out on a first LAN segment or other data path, and for receiving upstream  
26 LAN packets from said first LAN segment or other data path and transmitting them to  
27 a headend using whatever media access control and physical layer protocol is in use  
28 on said cable TV signal delivery medium for upstream transmissions;

29 packet switch means for receiving said downstream LAN packets transmitted  
30 on said first LAN segment or other data path, and determining to which subscriber  
31 each said downstream LAN packet is directed, and routing each packet to and  
32 transmitting said downstream LAN packets on an appropriate LAN segment dedicated  
33 to carrying upstream and downstream LAN packet traffic for the subscriber to whom  
34 said downstream LAN packets are addressed and which is coupled to an appropriate  
35 LAN segment input of said filtering and combining means, and for receiving upstream  
36 LAN packets from each said LAN segment dedicated to a particular subscriber and  
37 concentrating all said upstream LAN packets for transmission and transmitting all  
38 said upstream LAN packets on said first LAN segment or other data path to said cable  
39 modem means;

40 and wherein said shared cable modem means is also for receiving one or more  
41 radio frequency signals that carry digital data that is encoded with DSL signals  
42 directed a plurality of subscribers some of which share said cable modem and  
43 recovering said digital data that carries the DSL signals for each of the plurality of  
44 subscribers who share said cable modem, and transmitting said digital data to a DSL  
45 concentrator means via said first LAN segment or other data path, and for receiving  
46 upstream DSL packets and for transmitting them on said cable TV signal delivery  
47 medium using whatever media access control and physical layer protocol is in use on  
48 said cable TV signal delivery medium for upstream transmissions;

49 a DSL concentrator means for receiving said digital data that carries the  
50 downstream DSL signals for each subscriber which shares said cable modem from  
51 said shared cable modem means and for routing said digital data to the appropriate  
52 one of a plurality of XDSL modem means in or associated with said DSL concentrator  
53 that serves the particular subscriber to which said data is directed, and for  
54 receiving upstream DSL packets from said XDSL modems and routing them to said

5 5 cable modem means;

5 6 a plurality of XDSL modem means, each for converting digital data routed to it  
5 7 to a conventional XDSL signal and transmitting said XDSL signal on a twisted pair  
5 8 phone line to the one of a plurality of junction boxes in said filtering and combining  
5 9 means dedicated to coupling XDSL signals to be delivered to a particular customer to  
6 0 the twisted pair portion of a siamese cable drop line coupled to the subscriber to  
6 1 whom said DSL signal is to be sent; and

6 2 each said junction box structured to couple XDSL signals received from a  
6 3 particular XDSL modem means onto a twisted pair phone line forming part of said  
6 4 siamese cable drop line coupled to the subscriber to whom said XDSL signal is to be  
6 5 sent;

6 6 a plurality of siamese cable drop lines coupling said junction boxes to a  
6 7 plurality of subscribers, each having a twisted pair portion and a coaxial cable  
6 8 portion;

6 9 signal distribution means in each subscriber premises coupled to one of said  
7 0 siamese cable drop lines for selectively filtering to select analog CATV signals from  
7 1 the coaxial cable portion of said siamese cable drop line and couple said CATV signals  
7 2 onto a CATV signal distribution network at the premises of said subscriber, and for  
7 3 filtering to select downstream LAN packets from said coaxial cable portion of said  
7 4 siamese cable drop line and coupled them onto a LAN in said subscriber premises, and  
7 5 for coupling XDSL signals on a twisted pair portion of said siamese cable drop line  
7 6 onto a POTS telephone signal distribution network in said customer premises; and

7 7 XDSL modem means coupled to said POTS telephone signal distribution  
7 8 network for converting said XDSL signal to LAN packet traffic on a second LAN in said  
7 9 subscriber premises.

1 18. [Fig. 5 embodiment] A signal distribution system for serving a plurality of  
2 customers using a shared cable modem coupled to a shared cable TV signal distribution  
3 medium, comprising:

4 a shared cable modem coupled to said medium;

5 a plurality of siamese cable drop lines, each dedicated to carrying signals to  
6 one of the subscribers sharing said cable modem and each having a first coaxial cable



7 data path and a second twisted pair telephone line data path, each first coaxial cable  
 8 data path of a siamese cable drop line for coupling to a local area network and a CATV  
 9 signal delivery system of one of said plurality of subscribers which share said cable  
 10 modem.

11 a shared local area network packet switch and concentrator coupled by a local  
 12 area network segment or other data path to said modem and having at least one local  
 13 area network port for each subscriber that shares said modem;

14 a plurality of diplexer filters, each dedicated to one of said subscribers who  
 15 share said cable modem and each having a high frequency input coupled to said cable  
 16 TV signal delivery medium and a low frequency input coupled to a port of said packet  
 17 switch and concentrator dedicated to the same subscriber said diplexer filter is  
 18 dedicated to, and each having a drop cable output for coupling to said first coaxial  
 19 cable data path of a siamese cable drop line dedicated to the same subscriber said  
 20 diplexer filter is dedicated to, each diplexer filter having a junction box therein  
 21 having a twisted pair input and a twisted pair output for coupling to said twisted  
 22 pair data path portion of the siamese cable drop line dedicated to the same subscriber  
 23 said diplexer filter containing said junction box is dedicated to, each said diplexer  
 24 filter and junction box combination functioning to filter out all signals appearing at  
 25 said high frequency input except downstream analog cable TV broadcast signals and  
 26 couple said analog cable TV broadcast signals onto said first coaxial cable data path of  
 27 the siamese cable drop line coupled to said drop cable output, and to receive  
 28 downstream baseband LAN packet data from the port of said packet switch dedicated to  
 29 the customer said diplexer filter is dedicated to and couple said downstream LAN  
 30 packet data onto said first coaxial cable data path of said siamese cable drop line along  
 31 with said analog cable TV signals, and for filtering to select upstream LAN packet data  
 32 from said first coaxial cable data path of the siamese cable drop line from said  
 33 subscriber and transmit said upstream LAN packet data to the port of said packet  
 34 switch dedicated to carrying LAN packet data from the subscriber from which each  
 35 upstream LAN packet originated, and said junction box for coupling upstream and  
 36 downstream POTS signals between a twisted pair input of said junction box and said  
 37 second twisted pair data path of the siamese cable drop line corresponding to the same  
 38 subscriber said junction box/diplexer filter combination corresponds to;

39 a voice-over-IP gateway coupled to said shared cable modem by a LAN  
 40 segment or other data path to receive downstream voice-over-IP packets from said  
 41 cable modem and to transmit upstream voice-over-IP packets to said cable modem  
 42 for upstream transmission to a headend, each voice-over-IP gateway having a  
 43 plurality of subscriber line interface circuits that convert downstream voice-over-  
 44 IP packet data to POTS signals and transmit them on a twisted pair telephone line  
 45 coupled to said twisted pair input of the junction box corresponding to the subscriber  
 46 to which said POTS signals are to be transmitted such that POTS signals output by  
 47 each said subscriber line interface circuit are coupled through said junction box to  
 48 said second twisted pair data path of the siamese cable drop line coupled to the  
 49 subscriber to whom said POTS signals are to be delivered, each subscriber line  
 50 interface circuit also for converting upstream POTS signals received from said  
 51 second twisted pair data path of the siamese cable drop line corresponding to the  
 52 subscriber said subscriber line interface circuit services and converting said  
 53 upstream POTS signals to POTS digital data, and wherein said voice-over-IP gateway  
 54 delivers said POTS digital data from each subscriber to said cable modem for  
 55 upstream transmission to a headend; and

56 means in each subscriber premises coupled to a siamese cable drop line from  
 57 a diplexer filter/junction box combination for selecting analog downstream cable TV  
 58 broadcast signals and coupling them onto a CATV signal distribution system in said  
 59 subscriber's home and for selecting downstream LAN packets from said first coaxial  
 60 cable data path and coupling them onto a LAN transmission medium in said subscriber  
 61 premises and for selecting upstream LAN packets from said LAN transmission  
 62 medium in said subscriber premises and coupling them onto said first coaxial cable  
 63 data path of said siamese cable drop line, and for coupling upstream and downstream  
 64 POTS signals between a phone line distribution system in said subscriber premises  
 65 and said second twisted pair data path of said siamese cable drop line.

1 19. [Fig. 5 process] A process comprising:

2 receiving from a transmission medium a plurality of signals including  
 3 downstream analog CATV signals in each of a plurality of diplexer filters, and, in  
 4 each diplexer filter, filtering out all but said downstream analog CATV signals, and,

5 in each said diplexer filter, receiving at a baseband LAN input downstream baseband  
6 LAN packet data transmissions, and combining said downstream LAN packet data  
7 transmissions with said analog CATV signals and transmitting the combined signals on  
8 a coaxial cable portion of a siamese cable drop line coupled to a local area network of  
9 a predetermined one of a plurality of subscribers who is served by said diplexer  
10 filter, said plurality of subscribers all sharing a cable modem located outside the  
11 premises of said plurality of subscribers, and, in each diplexer filter, selecting  
12 upstream LAN packets from said coaxial cable portion of said siamese cable drop line  
13 and coupling them onto a LAN segment coupling said diplexer filter to a subscriber  
14 line interface circuit dedicated to servicing the subscriber from whom each said  
15 upstream LAN packet originated, and, in the junction box of each diplexer filter,  
16 coupling both upstream and downstream POTS telephone signals (hereafter upstream  
17 POTS and downstream POTS) between a twisted pair portion of said siamese cable  
18 drop line and a twisted pair coupled to a subscriber line interface circuit dedicated to  
19 servicing the subscriber from whom said upstream POTS originated;

20 receiving a plurality of signals from said transmission medium in a shared  
21 cable modem and filtering out all but downstream RF signals carrying downstream  
22 voice-over-IP packet data and LAN packet data, and recovering said downstream  
23 voice-over-IP packet data and LAN packet data, and selecting from said recovered  
24 packets only voice-over-IP packets and LAN packets addressed to a subscriber that is  
25 sharing said cable modem, and transmitting the selected downstream voice-over-IP  
26 packets out on a first LAN segment or other data path to a voice-over-IP gateway, and  
27 transmitting said LAN packets out on said first LAN segment or other data path to a  
28 packet switch shared by the same subscribers who share said cable modem, and  
29 receiving upstream LAN packet and upstream voice-over-IP packets from said  
30 shared packet switch and voice-over-IP gateway, respectively, and transmitting said  
31 packets to a headend using whatever media access control and physical layer  
32 protocols are used for the upstream on said transmission medium;

33 receiving said downstream voice-over-IP packets transmitted on said first  
34 LAN segment or other data path in said voice-over-IP gateway, and determining to  
35 which subscriber who is sharing said cable modem each said downstream voice-  
36 over-IP packet is directed, and routing each downstream voice-over-IP packet to an

37 appropriate subscriber line interface circuit which is coupled by a twisted pair  
 38 telephone line to a twisted pair input of a junction box in a diplexer filter which  
 39 services the subscriber to whom said downstream voice-over-IP packet is directed,  
 40 and, in each said subscriber line interface circuit converting said voice-over-IP  
 41 packet data to said downstream POTS and transmitting said downstream POTS on said  
 42 twisted pair, and, in each said subscriber line interface circuit and converting  
 43 upstream POTS to digital data and in said voice-over-IP gateway, converting said  
 44 digital data from each subscriber line interface circuit to upstream voice-over-IP  
 45 packets and sending them to said shared cable modem;

46 in said packet switch, receiving the downstream LAN packet data from said  
 47 cable modem for each subscriber which shares said cable modem and routing said  
 48 each downstream LAN packet to an appropriate LAN port in said switch which is  
 49 coupled via a LAN segment and transmitting said downstream LAN packet to the  
 50 subscriber to whom the packet is addressed via said LAN segment and said baseband  
 51 LAN input of a diplexer filter dedicated to said subscriber and the coaxial cable  
 52 portion of a siamese cable drop line to a LAN of a subscriber to which each said LAN  
 53 packet is addressed, and receiving from each subscriber and the diplexer filter, LAN  
 54 segment and LAN port dedicated to said subscriber said upstream LAN packets and  
 55 transmitting them to said cable modem for transmission to a headend;

56 in each subscriber premises, selectively filtering to select said downstream  
 57 analog CATV signals and coupling them onto a CATV signal distribution network inside  
 58 said subscriber premises, and selectively filtering to select downstream LAN packets  
 59 and coupling them onto a LAN transmission medium inside said subscriber premises,  
 60 and selectively filtering so as to couple upstream LAN packets from said LAN  
 61 transmission medium onto said coaxial cable portion of said siamese cable drop line,  
 62 and coupling said downstream POTS from said twisted pair portion of said siamese  
 63 cable drop line to a telephone signal distribution system inside said customer  
 64 premises, and coupling upstream POTS from said telephone signal distribution  
 65 system inside said customer premises to said twisted pair portion of said siamese  
 66 cable drop line.

20. [Fig. 5 means plus function] An apparatus comprising:

filtration and combining means coupled to a cable TV signal delivery medium and having a plurality of diplexer filters, each dedicated to serving one subscriber and each having a junction box means, for filtering out all but downstream analog CATV signals from signals received from said cable TV signal delivery medium, and for receiving at a baseband LAN input baseband packet data transmissions, and for combining said baseband packet data transmissions with said downstream analog CATV signals and transmitting the combined signals on a coaxial cable portion of a siamese cable drop line coupled to a local area network of a predetermined one of a plurality of subscribers who share a cable modem means located outside the premises of said subscribers, and for filtering to select upstream LAN packets from signals on said coaxial cable portion of a siamese cable drop line and transmit them on a LAN segment coupled to said baseband LAN input, each said junction box means for coupling upstream and downstream POTS signals between a twisted pair portion of said siamese cable drop line and a twisted pair segment;

cable modem means for receiving and recovering downstream voice-over-IP packet data and downstream LAN packets from signals propagating on said cable TV signal delivery medium, and for filtering out all voice-over-IP packets and LAN packet not addressed to a subscriber that is sharing said cable modem means and transmitting the selected packets out on a first LAN segment or other data path to a voice-over-IP gateway means and to a packet switch means, and for receiving upstream LAN and voice-over-IP packets and transmitting them to a headend using whatever media access control and physical layer protocol is in use for upstream transmissions on said cable TV signal delivery medium;

voice-over-IP gateway means for receiving said voice-over-IP packets transmitted on said first LAN segment or other data path and for determining to which subscriber each said voice-over-IP packet is directed, and routing each voice-over-IP packet to an appropriate one of a plurality of subscriber line interface circuit means which is coupled by a twisted pair segment telephone line to a twisted pair input of one of said junction box means in said filtration and combining means which is coupled by a siamese cable drop line to the premises of the subscriber to which said voice-over-IP packet is addressed, and for receiving data

33 from each subscriber line interface circuit means created from upstream POTS  
 34 signals from the subscriber to which said subscriber line interface circuit means is  
 35 dedicated and packetizing said data as a voice-over-IP packet and transmitting said  
 36 voice-over-IP packet to said cable modem means;

37 a plurality of subscriber line interface circuit means, each for converting  
 38 said voice-over-IP packet data routed to it by said voice-over-IP gateway means to a  
 39 downstream POTS signal and transmitting said downstream POTS signal on a twisted  
 40 pair segment telephone line coupled to a junction box means in said filtration and  
 41 combining means which is coupled to the subscriber to which said downstream POTS  
 42 signal is to be delivered;

43 a packet switch means for receiving downstream LAN packet data for each  
 44 subscriber which shares said cable modem means from said first LAN segment or  
 45 other data path coupled to said shared cable modem, and for routing said downstream  
 46 LAN packet data to an appropriate LAN port in said packet switch means which is  
 47 coupled to the LAN of a subscriber to which said LAN packet data is addressed via a  
 48 LAN segment coupled to the baseband LAN input of said filtration and combining  
 49 means that is dedicated to LAN traffic of said subscriber, and, at each said LAN port,  
 50 transmitting said LAN packet data on said LAN segment to said filtration and  
 51 combining means, said packet switch means also for receiving upstream LAN packets  
 52 and routing them to said cable modem means.

1 21. [DirecPC embodiment] A signal delivery system comprising:

2 first means shared by a plurality of subscribers for receiving and  
 3 distributing television broadcasts to said plurality of subscribers via a first data  
 4 path transmission medium going into each subscriber premises;

5 second means shared by a plurality of subscribers for receiving downstream  
 6 digital data and transmitting said data into each subscriber's premises in a digital  
 7 and/or analog signal format via said first data path and/or a second data path of said  
 8 transmission medium going into said subscriber's premises, and for receiving  
 9 upstream digital data transmitted from each subscriber premises in digital and/or  
 10 analog format and converting said upstream digital data to a proper format for  
 11 transmission upstream via an upstream transmission medium to a headend using

12 whatever media access control and physical layer protocol is in use on said upstream  
13 transmission medium.

1 22. [Figure 12 embodiment] A signal distribution system, comprising:

2 a shared network device, having one or more cable modem, each shared by a  
3 plurality of consumers and each coupled to a headend through a transmission  
4 medium;

5 a media terminal adapter coupled to receive LAN packets and VOIP packets  
6 from said shared cable modem via a LAN segment and functioning to convert  
7 downstream VOIP packets into analog downstream POTS signals in a POTS frequency  
8 band and modulate said downstream LAN packets onto a data carrier having a  
9 spectrum which does not conflict with the spectrum of said POTS signals, and  
10 functioning to receive upstream POTS signals and convert them to upstream VOIP  
11 packets and send them to said shared network device and to receive upstream LAN  
12 packets and transmit them to said shared network device; and

13 a LAN segment coupled to a LAN inside a subscriber premises, for carrying  
14 analog upstream and downstream POTS signals and LAN packets modulated on a data  
15 carrier having a frequency outside the frequency band of said POTS signals.

1 23. [Figure 12 embodiment- means plus function] A signal distribution system,  
2 comprising:

3 a shared network device means, having one or more cable modem means, each  
4 shared by a plurality of consumers and each coupled to a headend through a  
5 transmission medium, said shared network device means for supplying analog CATV  
6 signals directly to each of a plurality of subscribers who share said shared network  
7 device means and each said cable modem means for receiving and recovering  
8 downstream LAN and VOIP packets addressed to one of the subscribers who shares  
9 said cable modem means and for transmitting said recovered LAN and VOIP packets on  
10 a first LAN segment, and said cable modem means also for receiving upstream LAN  
11 and VOIP packets from each subscriber who shares a cable modem means, and  
12 transmitting them to a headend via said transmission medium using whatever media  
13 access control and physical layer protocols are in use for upstream transmissions on

said transmission medium;

a plurality of media terminal adapter means, each dedicated to servicing a particular subscriber who shares a shared cable modem to which said media terminal adapter means is coupled, each said media terminal adapter means coupled via a LAN segment to receive downstream LAN packets and VOIP packets from a shared cable modem, each media terminal adapter means for converting downstream VOIP packets into analog downstream POTS signals in a POTS frequency band and for modulating said LAN packets onto a data carrier having a spectrum which does not conflict with the spectrum of said downstream POTS signals, and for receiving upstream POTS signals and convert them to upstream VOIP packets and sending them to said shared network device and for receiving upstream LAN packets and transmitting them to the appropriate shared cable modem means of said shared network device; and

plurality of LAN segments, each LAN segment coupled to a LAN inside a particular subscriber's premises for carrying analog upstream and downstream POTS signals and LAN packets modulated on a data carrier having a frequency outside the frequency band of said POTS signals.

24. [process of Figure 12] A signal distribution process, comprising the steps of:

supplying analog CATV signals directly to each of a plurality of subscribers who share a shared network device and using each of a plurality of shared cable modems to receive and recover downstream LAN and VOIP packets addressed to one of the subscribers who shares said cable modem and transmitting each said recovered LAN and VOIP packet addressed to a particular subscriber who shares said cable modem on a first LAN segment to a media terminal adapter which is dedicated to processing traffic to and from that subscriber;

receiving upstream LAN and VOIP packets from each subscriber who shares said network device and transmitting them to a shared cable modem shared by the subscriber from whom said upstream LAN and VOIP packets originated and using said cable modem to transmit said upstream LAN and VOIP packets to a headend via said transmission medium using whatever media access control and physical layer protocols are in use for upstream transmissions on said transmission medium;



15                   in each of said plurality of media terminal adapters, converting downstream  
16                   VOIP packets into analog downstream POTS signals in a POTS frequency band and  
17                   modulating said LAN packets onto a data carrier having a spectrum which does not  
18                   conflict with the spectrum of said downstream POTS signals, and receiving upstream  
19                   POTS signals and converting them to upstream VOIP packets and sending them to the  
20                   cable modem shared by the subscriber from who said upstream POTS signals  
21                   originated, and receiving upstream LAN packets and transmitting them to the cable  
22                   modem shared by the subscriber from who said upstream LAN packets originated.

15                   in each of said plurality of media terminal adapters, converting downstream  
16                   VOIP packets into analog downstream POTS signals in a POTS frequency band and  
17                   modulating said LAN packets onto a data carrier having a spectrum which does not  
18                   conflict with the spectrum of said downstream POTS signals, and receiving upstream  
19                   POTS signals and converting them to upstream VOIP packets and sending them to the  
20                   cable modem shared by the subscriber from who said upstream POTS signals  
21                   originated, and receiving upstream LAN packets and transmitting them to the cable  
22                   modem shared by the subscriber from who said upstream LAN packets originated.